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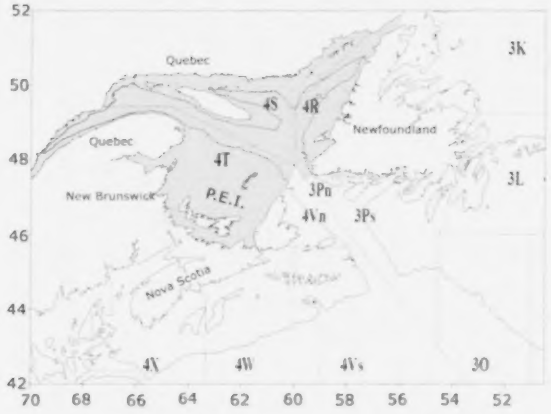
STOCK ASSESSMENT OF ATLANTIC HALIBUT OF THE GULF OF ST. LAWRENCE (NAFO DIVISIONS 4RST) FOR 2011 AND 2012



Map of the Gulf of St. Lawrence and neighbouring regions showing NAFO divisions 4RST. Divisions 4RST correspond to the shaded area.

Context

The Atlantic halibut commercial fishery in the Gulf of St. Lawrence began at the end of the 19th century. During the first half of the 20th century, this resource was exploited by American and Canadian fleets. It was not unusual at the time to see annual landings of around 1,000 t. Beginning in the second half of the 20th century, exploitation was almost exclusively carried out by the Canadian fleet from the four Atlantic Provinces as well as Quebec. From over 600 t during the 1960s, landings steadily decreased until the early 1980s, totalling 90 t in 1982. Landings increased again in the late 1990s and are now at 730 t, the highest level recorded in the past 50 years.

The current Atlantic halibut stock management unit in the Gulf, NAFO Divisions 4RST, was defined in 1987. In 1988, Management introduced the first total allowable catch (TAC) set at 300 t. This TAC was increased to 350 t in 1999 following recommendations by the FRCC and was increased further to 475 t in 2007, 600 t in 2010, and finally, 720 t in 2011. A minimum legal catch size set at 81 cm was added to the Gulf halibut exploitation conditions in 1997. The minimum legal catch size was increased to 85 cm in 2010. The fishing season begins on May 15 and ends on May 14 the following year. The Atlantic halibut directed fishery is carried out by longliners on a competitive basis or by Individual Transferable Quota (ITQ). Atlantic halibut represent a by-catch for other fleets, in particular the Greenland halibut gillnet fleet. Landings of Atlantic halibut by this fleet totalled over 12% of the overall landings in the Gulf in 2012 for the species.

Assessment of the resource was conducted on an annual basis until 2005 and biennially since. The current assessment puts into perspective the available information on the biological characteristics of the Gulf halibut and its commercial exploitation for 2011 and 2012.

SUMMARY

- Reported landings for the last two fishing years are the highest recorded in the past 50 years, reaching 737 t in 2011–2012 and 700 t (preliminary as of December 31, 2012) in 2012–2013, corresponding respectively to 102% and 97% of the total allowable catch of 720 t allocated for each of these two years. This TAC was raised by 20% in 2011–2012.

- In 2012, 102 t of halibut, or 14% of the TAC, were landed as by-catch in the gillnet fishery. Of these landings, 95% came from the Greenland halibut directed fishery. It was estimated that a high proportion (60% in numbers) of the halibut catches in this fishery were below the minimum legal catch size of 85 cm. These fish were discarded at sea without being recorded and presumably with a high (greater than 50%) mortality rate.

- The various abundance and biomass indicators from scientific trawl surveys rose dramatically between 2000 and 2006 and reached maximum historical values between 2007 and 2010. These indicators have since remained relatively stable. The range of sizes measured during the surveys remains very broad.

- Catch per unit effort (CPUE) values calculated for the directed Atlantic halibut longline fishery in 4RST have been very high and stable over the last four years. In 2012, longline catches recorded at sea showed that pre-recruits were still abundant (25% in numbers) whereas the proportion of halibut larger than 130 cm was steady at about 10%.

- The modal size of halibut measured dockside over the last two years is 91 cm. This indicates that a large proportion of the fish landed are immature. The length at which 50% of halibut reach sexual maturity is 92 cm for males and 130 cm for females.

- In light of this assessment, the species' long life cycle and late maturity, and the lack of information on the stock's productivity, caution should be exercised when deciding to increase catches. The suggestion is therefore to increase the TAC by a maximum of 20% in total for the next two fishing years.

- However, industry stakeholders disagree with this recommendation. In their opinion, the stock is still growing. They consider that the TAC increase should be higher.

INTRODUCTION

Species Biology

Atlantic halibut, the largest flatfish in the Northwest Atlantic, is a prized species on the market. However, knowledge pertaining to the biology and stock status of the Gulf of St. Lawrence halibut is limited.

The Gulf Atlantic halibut stock (NAFO Divisions 4RST) can be found throughout the Estuary and Gulf of St. Lawrence. The mean annual growth rate of Atlantic halibut in the Gulf was evaluated at 7.5–8.5 cm. Male and female growth rates are comparable. However, females reach a larger maximum size than males. This could be due to the fact that Atlantic halibut females reach sexual maturity at a larger size than males. Based on recent research, the size

at sexual maturity (L_{50} where 50% of fish are mature) for the Atlantic halibut Gulf stock is 130 cm for females and 92 cm for males. Based on observations made during scientific surveys, Gulf halibut is able to spawn between January and May.

The diet of the Gulf Atlantic halibut stock, as determined from stomach contents collected between May and November, is similar to that described for Atlantic halibut elsewhere. In the Gulf, halibut of less than 30 cm eat mainly invertebrates such as krill, northern shrimp and other shrimp, while larger halibut have a more piscivorous diet (Denis Chabot, Maurice Lamontagne Institute, pers. comm.). Thus, halibut measuring 30–80 cm mostly feed on snow crab, Northern shortfin squid, and various species of small fish such as capelin, fourbeard rockling, witch flounder, blennies, eelpouts and sculpins. Commercial size halibut primarily feed on herring, cod, redfish and flatfish.

Results from the Atlantic halibut tagging program conducted in the Gulf and in sub-division 3Pn indicate that tagged fish in the commercial fishery are mainly recaptured in the same division where they were tagged or within the Gulf stock management unit (NAFO Divisions 4RST). A small percentage (about 15%) of individuals was recaptured outside the Gulf management unit. The latter was defined in 1987 based on the tagging-recapture study results and on additional biological information (e.g., size and growth rate).

Description of the Fishery

The significant landings (average of around 1,500 t) of Atlantic halibut harvested in the Gulf of St. Lawrence during the first half of the 20th century (Figure 1) indicate that this stock was once very abundant and associated with a very high CPUE. Halibut landings, which were around 650 t in the early 1960s, hit a record low in 1982 at 91 t. Until 1995, they seldom exceeded 300 t, the TAC established in 1988. Ranging between 260 and 420 t between 1996 and 2006, landings exceeded 500 t in 2008 and reached their highest levels in the past 50 years in 2011 and 2012 (700+ t) (Table 1).

Table 1. Atlantic halibut landings (mt) in Divisions 4RST.

Division	Year									
	1953-1969[1]	1970-1987[1]	1988-1998[1]	1999-2006[1]	2007	2008	2009	2010	2011	2012[2]
TAC	nil	nil	300	350-450	475	475	475	600	720	720
4R	197	95	85	114	142	228	253	192	179	290
4S	144	74	73	112	163	167	190	186	304	226
4T	91	77	91	115	127	165	203	250	246	289
Total	435	245	249	342	432	560	646	628	729	804

Landings according to calendar year

[1] *Average*

[2] *Preliminary data as of December 31, 2012*

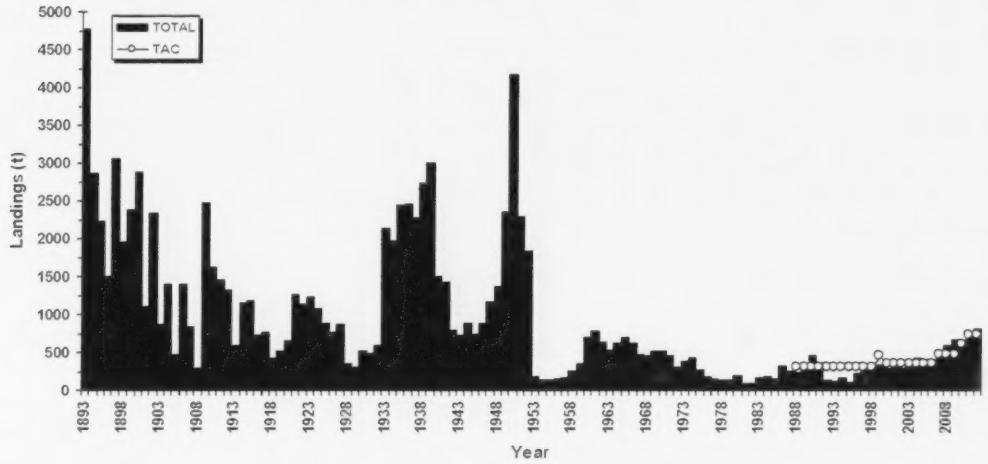


Figure 1. Atlantic halibut annual landings (t) and total allowable catch (TAC) for NAFO Divisions 4RST. 2012 data are preliminary.

From 300 t starting in 1988, the TAC was increased to 350 t for the 1999 fishing season (January 1 – December 31) based on a recommendation from the Fisheries Resource Conservation Council (FRCC). Yet due to the application of the new groundfish management period in 1999 whereby the fishing year began running from May 15 of that year to May 14 of the following year, an additional TAC of 100 t was granted by Management to cover this period only. The TAC was subsequently raised to 475 t for the 2007–2009 fishing seasons; to 600 t for the 2010 season; and, in keeping with the recommendation from Sciences, to 720 t for the 2011 and 2012 fishing seasons. During the last two years, the TAC was divided among 13 geographic fleets (nine with fixed gear and four with mobile gear) in Quebec and the four Atlantic Provinces. The Atlantic halibut directed fishery is carried out by longliners on a competitive basis or by Individual Transferable Quota (ITQ).

Several management measures have been introduced over the years to protect the resource, in addition to the TAC. In 1997, a minimum legal catch size of 81 cm, based on a yield and value per recruit model, was added to the Canadian commercial fishing license conditions for Atlantic halibut. In 2007, Sciences had recommended that any catch increase be accompanied by a gradual increase in the minimum legal catch size. This last management measure was not introduced until the 2010 fishing season, along with the TAC increase to 600 t, even though fishery stakeholders opposed it on the grounds that certain markets prefer halibut of 80–100 cm (under 25 lbs). Since that year, the minimum legal catch size is 85 cm for all the Gulf Atlantic halibut stock and any halibut below that size must be returned to the water.

Meanwhile, mandatory discarding of commercial size halibut by-catches by cod directed longline fleets in the Gulf, the Maritimes and Newfoundland and Labrador was implemented in 2008 and 2009. This measure was also made effective in the Magdalen Islands after that geographical fleet reached its Atlantic halibut allocation. However, all other fleets in Quebec had to keep their catches on board and land them. In 2010, the release of commercial-size halibut by-catches caught by longline in the cod directed fishery was only mandatory in Newfoundland. This measure was also implemented among Quebec longliners in 2011 and 2012. It is to be noted that halibut releases are not recorded.

There are other existing management measures, such as a dockside commercial catch monitoring program (100%), at-sea coverage by observers (percentage varies by fleet), mandatory logbooks (except for vessels < 10.67 m in Newfoundland), predetermined fishing periods, limits on the size and maximum number of hooks allowed per line, by-catch protocols and, for large longliners in Quebec, a vessel monitoring system (VMS/black box). Finally, a quota conciliation program was introduced in 2010 and became effective at the start of the 2011 fishing season. Consequently, any fleet exceeding its quota in the fishery in a given year sees its quota reduced the following year by its quota overage.

Preliminary total Atlantic halibut landings in Divisions 4RST as of December 31, 2012, were 700 t, or 97% of the TAC of 720 t allocated for the fishing season ending on May 14, 2013. More than 80% of halibut catches are made within a four-month period (May–August). Consistent with the last 10 years, over 95% of the landings were made by the fixed gear fleet, primarily longliners (Table 2). Since 2006, the share of halibut landings corresponding to by-catch caught by gillnet fishing amounted to more than 10% of total halibut landings and even as much as 19% in 2008. Among the landings associated with this fleet over the last five years, more than 80% were from the Greenland halibut directed fishery (Table 3).

Table 2. Atlantic halibut commercial landings (t) by gear for Divisions 4RST. 2012 data are preliminary.

Year	FIXED GEARS							MOBILE GEARS							Unknow		TOTAL	TAC
	Gillnet	Handline	Longline	Trap	Others	TOTAL	%	Bottom trawl (fish)	Bottom trawl (shrimp)	Pelagic trawl	Danish seine	Others	TOTAL	%	TOTAL	%		
1988	33	17	137	0	0	187	78.6	23	23	5	0	0	51	21.4	0	0.0	238	300
1989	73	18	135	0	0	226	77.7	50	15	0	0	0	65	22.3	0	0.0	291	300
1990	69	34	238	0	0	341	75.6	94	13	0	0	0	107	23.7	3	0.7	451	300
1991	43	7	263	0	0	313	86.5	32	13	0	0	0	45	12.4	4	1.1	362	300
1992	11	3	86	0	0	100	70.4	11	23	0	7	0	41	28.9	1	0.7	142	300
1993	19	4	96	0	0	119	93.0	1	8	0	0	0	9	7.0	0	0.0	128	300
1994	20	0	91	1	0	112	63.3	4	2	0	2	0	8	4.5	57	32.2	177	300
1995	23	0	35	7	0	65	65.7	3	0	0	0	0	3	3.0	31	31.3	99	300
1996	14.2	26.0	154.0	4.2	0	198.4	84.5	10.3	0.8	0	0.4	2.4	13.9	5.9	22.4	9.5	134.7	300
1997	32.5	0.6	230.2	0.1	0	263.4	89.0	7.1	2.4	0	5.5	8.2	23.2	7.8	9.5	3.2	296.1	300
1998	20.6	0.1	272.9	0	0.5	294.1	91.8	10.0	0.6	0	0.3	1.6	12.5	3.9	13.6	4.2	320.2	300
1999	29.5	0.3	218.7	0	0	248.5	94.1	11.5	1.1	0	0.7	2.3	15.6	5.9	0	0.0	264.1	450
2000	27.3	0.8	271.0	0	0	299.1	95.3	13.2	0.6	0.2	0.2	0.5	14.7	4.7	0	0.0	313.8	350
2001	25.7	0.4	274.8	0	0	300.9	96.0	7.6	1.8	0	0.7	2.3	12.4	4.0	0	0.0	313.3	350
2002	16.7	0.9	287.4	0	0	305.0	95.8	7.6	1.9	0	0.8	1.7	12.0	3.8	1.5	0.5	318.5	350
2003	24.3	0	270.9	0	0	295.2	96.1	7.9	2.0	0	0.1	1.9	11.9	3.9	0	0.0	307.1	350
2004	20.7	0.6	384.6	0	0	405.9	97.6	3.5	2.8	0	2.7	1.1	10.1	2.4	0	0.0	416.0	350
2005	28.8	1.1	366.9	0	0	396.8	96.1	4.9	2.0	0.1	5.1	4.0	16.1	3.9	0	0.0	412.9	350
2006	42.6	1.5	330.6	0	0.9	375.6	96.8	6.5	1.5	0	2.3	2.1	12.4	3.2	0	0.0	388.0	350
2007	63.5	1.7	348.2	0	0	413.4	95.8	4.0	3.6	0	1.1	9.4	18.1	4.2	0	0.0	431.5	475
2008	106.8	0	440.5	0	0	547.3	97.8	1.9	4.4	0	1.8	4.3	12.4	2.2	0	0.0	559.7	475
2009	78.6	5.4	547.1	0	0	631.1	97.7	7.6	3.5	0	0.6	3.3	15.0	2.3	0	0.0	646.1	475
2010	83.0	0.9	533.1	0	0	617.0	98.2	5.6	3.3	0	0	2.1	11.0	1.8	0	0.0	628.0	600
2011	79.6	0	640.4	0	0	720.0	98.7	4.8	2.9	0	0.1	1.4	9.2	1.3	0	0.0	729.2	720
2012	102.4	0.6	689.9	0	0	792.9	98.6	6.6	3.5	0	0.1	1.0	11.2	1.4	0.2	0.0	804.3	720
1988-2011	41.1	5.1	277.2	0.5	0.1	323.9	88.0	13.8	5.5	0.2	1.3	2.0	22.9	8.2	6.0	3.8	352.8	300-720
2007-2011	82.3	1.6	501.9	0.0	0.0	585.8	96.8	4.8	3.5	0.0	0.7	4.1	13.1	3.2	0	0.0	598.9	475-720

Landings according to calendar year

[1]: *data from ZIF*

[2]: *data from preliminary ZIF*

[3]: *mean*

Table 3. Atlantic halibut landings (mt) from different directed fisheries in 4RST. 2012 data are preliminary.

	Directed species								
	Atlantic halibut		Cod		Commun lumpish		Greenland halibut		All species
	(t)	%	(t)	%	(t)	%	(t)	%	(t)
Year	Used gear: Longline								
2005	271.7	74.1	70.4	19.2	0	0.00	3.5	0.96	366.9
2006	291.0	88.0	34.1	10.3	0.04	0.01	2.0	0.61	330.6
2007	309.9	89.0	33.0	9.5	0	0.00	3.8	1.09	348.2
2008	361.8	82.1	77.9	17.7	0	0.00	0.3	0.08	440.5
2009	506.0	92.5	43.9	8.0	0	0.00	1.6	0.29	547.1
2010	498.7	93.5	17.5	3.3	0.06	0.01	0.9	0.16	533.1
2011	582.0	90.9	56.9	8.9	0.01	0.00	0.0	0.00	640.4
2012	646.2	93.7	34.9	5.1	0	0.00	8.8	1.28	689.9
Year	Used gear: Gillnet								
2005	2.2	7.6	1.2	4.3	1.10	3.81	10.9	37.7	28.8
2006	0.7	1.6	0.1	0.2	6.46	15.16	24.5	57.5	42.6
2007	0.6	0.9	1.1	1.8	6.45	10.16	36.9	58.1	63.5
2008	0.5	0.4	1.0	0.9	11.35	10.63	88.2	82.5	106.8
2009	0.1	0.1	0.5	0.6	7.05	8.97	64.3	81.8	78.6
2010	0.6	0.8	0.7	0.9	5.99	7.25	70.7	85.6	82.6
2011	0.2	0.3	0.2	0.3	6.10	7.64	72.8	91.2	79.8
2012	1.3	1.3	0.3	0.3	3.61	3.53	97.0	94.7	102.4

Landings according to calendar year

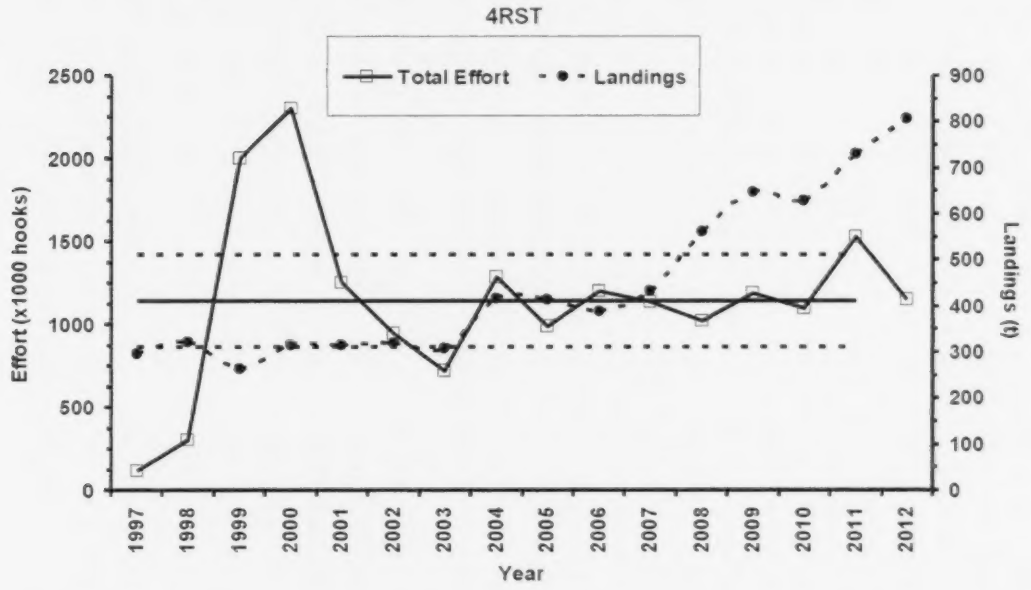


Figure 2. Total effort (x1,000 hooks) of the Atlantic halibut directed longline commercial fishery in relation to Atlantic halibut total annual landings (t) for NAFO Divisions 4RST (the solid line represents the series mean for all years except 2012 and the dashed lines ± 0.5 standard deviation).

Landings have increased steadily since the mid-2000s, while the total fishing effort has remained at a relatively constant mean of 1.15 million hooks (Figure 2). Although the 2011 and 2012 landings are the highest recorded in the past 50 years at 700+ tons, this figure remains below the 1,000-ton level often recorded during the first half of the 20th century.

ASSESSMENT

Distribution, Abundance and Biomass

The available abundance and biomass data for the Gulf Atlantic halibut stock come from two summer scientific trawl surveys conducted by DFO and two summer surveys conducted by the mobile gear sentinel fishery program in the Northern and Southern Gulf.

The halibut catches made during the trawl surveys are distributed throughout the Estuary and Gulf of St. Lawrence. In the Estuary and the northern part of the Gulf, halibut are more abundant at depths of 200 m or more in the Esquiman, Anticosti and Laurentian channels (Figure 3). In the southern part of the Gulf, catches are generally made at shallower depths (less than 100 m) around the Magdalen basin and along the southern edge of the Laurentian Channel (Figure 4). Halibut distribution index values (Designated Weighted Area Occupied [DWAO] and geographic area D95) rose dramatically for all surveys during the 2000s to reach their peak late in that decade (Figure 5). These index values are currently more than three times the values observed at the start of each series.

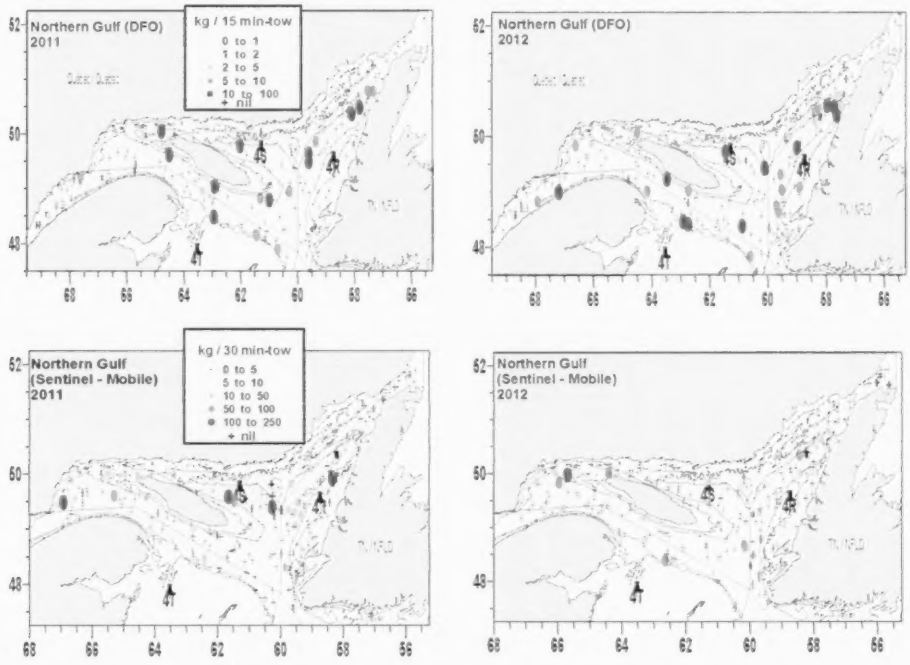


Figure 3. Catch rate spatial distribution for Atlantic halibut observed on scientific trawl surveys in the Northern Gulf in summer 2011 and 2012.

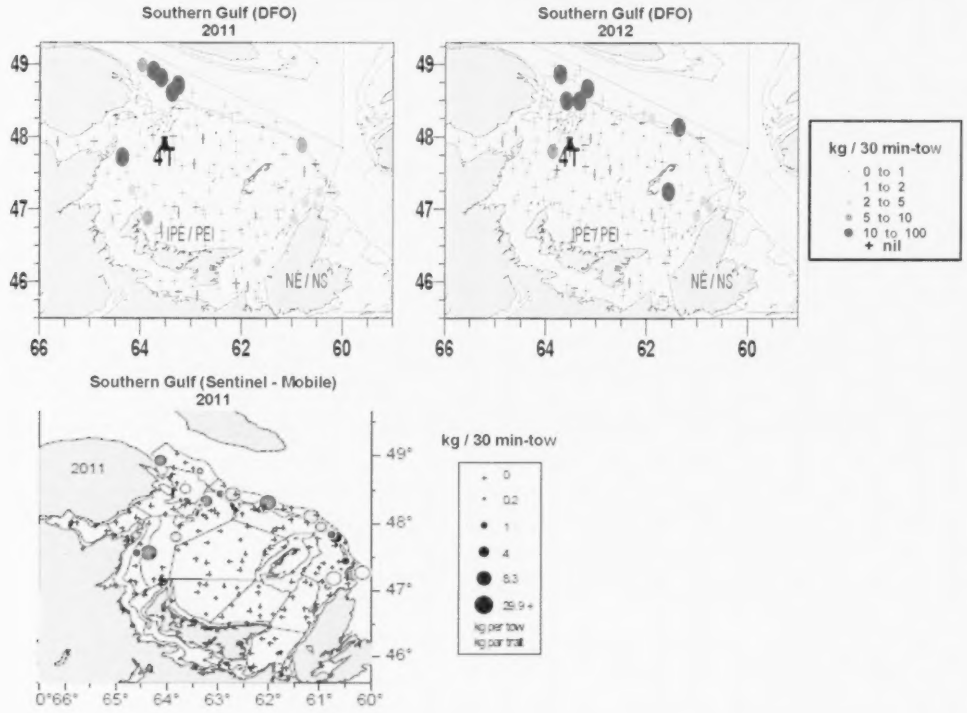


Figure 4. Catch rate spatial distribution pattern for Atlantic halibut observed on scientific trawl surveys in the Southern Gulf in summer 2011 and 2012.

Even if the trawl catchability for large-size Atlantic halibut is reduced on account of their superior ability to avoid the fishing gear, the trends observed in terms of abundance and biomass indicators reflect changes in stock abundance, particularly with regard to pre-recruits (i.e., all halibut below the minimum legal catch size). Thus, since the early 2000s, the indices have more than quadrupled for the DFO surveys in the Northern and Southern Gulf as well as for the mobile gear sentinel program survey in the Northern Gulf (Figure 6). The values observed since 2010 seem to have reached a ceiling, although they remain among historical highs and greatly exceed the series mean. The indices observed as part of the mobile gear sentinel fishery program survey in the Southern Gulf, meanwhile, remained more or less stable between 2003 and 2011 at much lower levels than for the other three surveys (Figure 7).

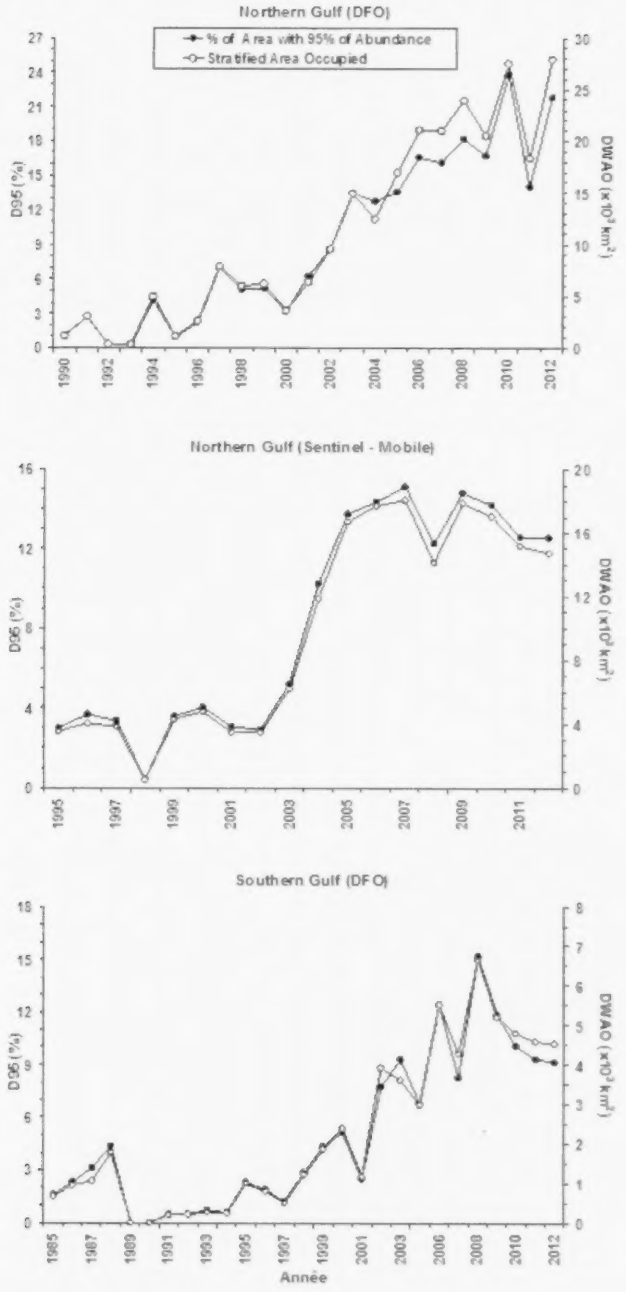


Figure 5. Atlantic halibut distribution indices (DWAO and D95) calculated for the scientific trawl surveys. DWAO: Designated Weighted Area Occupied (Smedbol et al. 2002); D95: minimum area in km^2 containing 95% of the stock (Swain and Sinclair 1994).

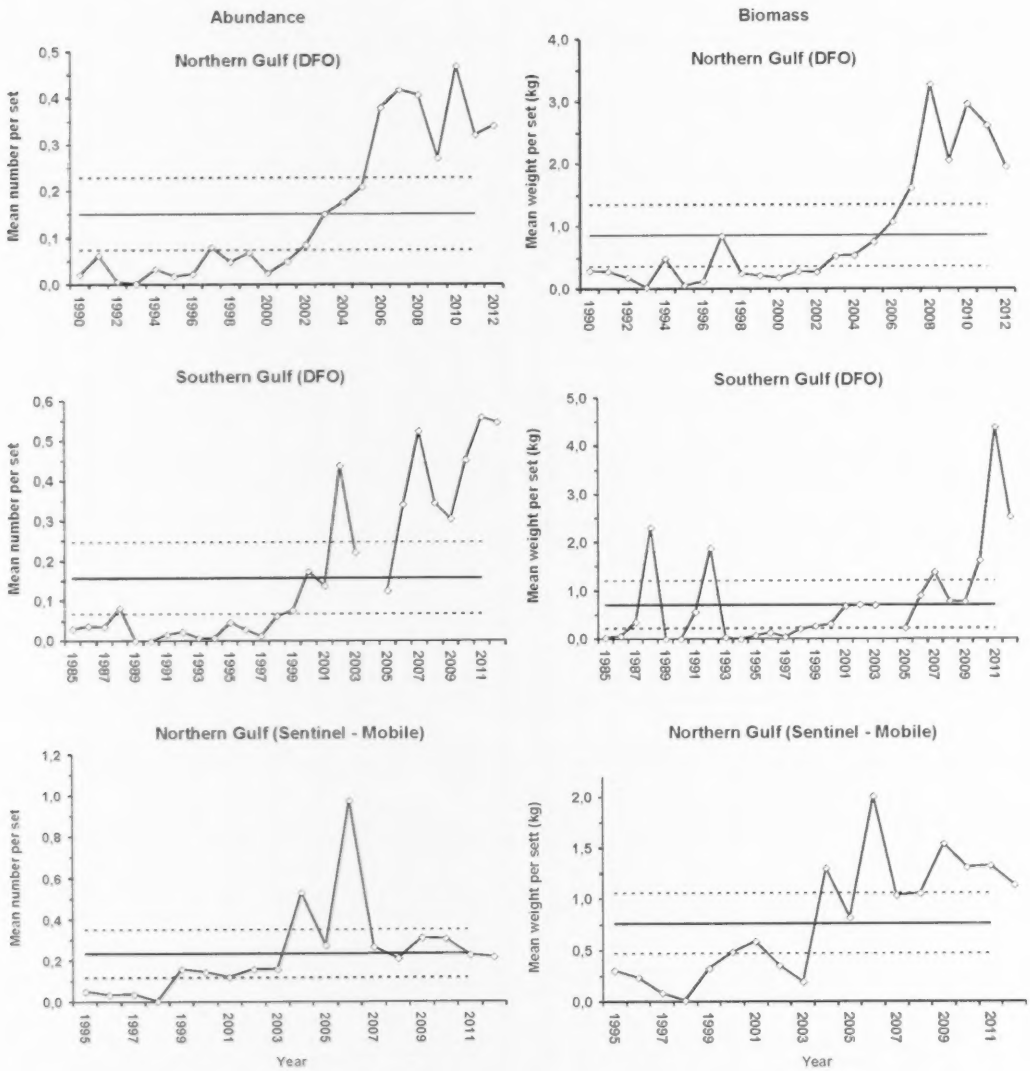


Figure 6. Estimated abundance and biomass indices for Atlantic halibut based on the summer DFO scientific trawl surveys (Northern and Southern Gulf) and mobile gear sentinel fishery program (the solid line represents the series mean for all years except 2012 and the dashed lines ± 0.5 standard deviation).

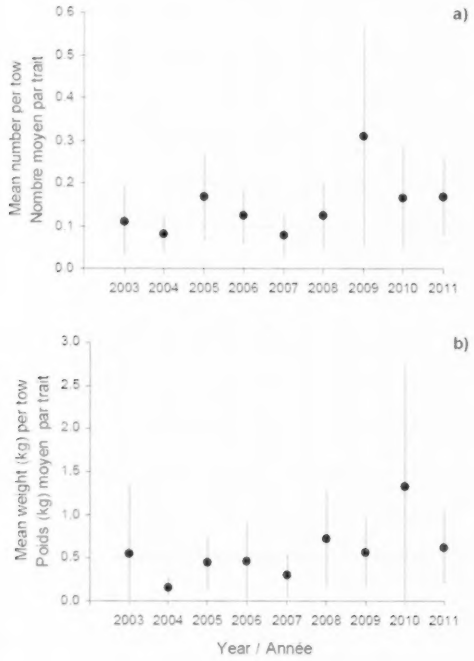


Figure 7. Estimated abundance and biomass indices for Atlantic halibut based on the summer mobile gear sentinel fishery trawl surveys in the Southern Gulf (Savoie 2012).

Fishing Effort and Commercial Catch Rate

Fishing effort and catch per unit effort (CPUE) were calculated using (1) statistics on catch and effort for the Atlantic halibut directed longline commercial fishery and (2) scientific logbooks fulfilled by Newfoundland fishermen. CPUE is defined here as weight (kg) of halibut catch per 1,000 hooks. CPUE data were standardized to account for differences between fishing areas, fleets, soak times and fishing months.

The catch rate spatial distribution pattern observed in 2011 and 2012 represents the halibut geographic distribution in the Estuary and Gulf of St. Lawrence (Figure 8). In the Southern Gulf, the highest catch rates were recorded on the Miscou Bank and the northern coast of Prince Edward Island, as well as around the Magdalen Islands. The highest catch rates in the Northern Gulf are found along or in the Esquiman, Anticosti and Laurentian channels and on the Sept-Îles Bank. CPUE values for both the 4RST management unit overall and all individual divisions increased steadily throughout the 2000s to reach their peaks between 2010 and 2012 (Figure 9). At the same time, fishing effort dropped dramatically between 2000 and 2003 and then fluctuated around an intermediate level for several years before decreasing again during these past five years.

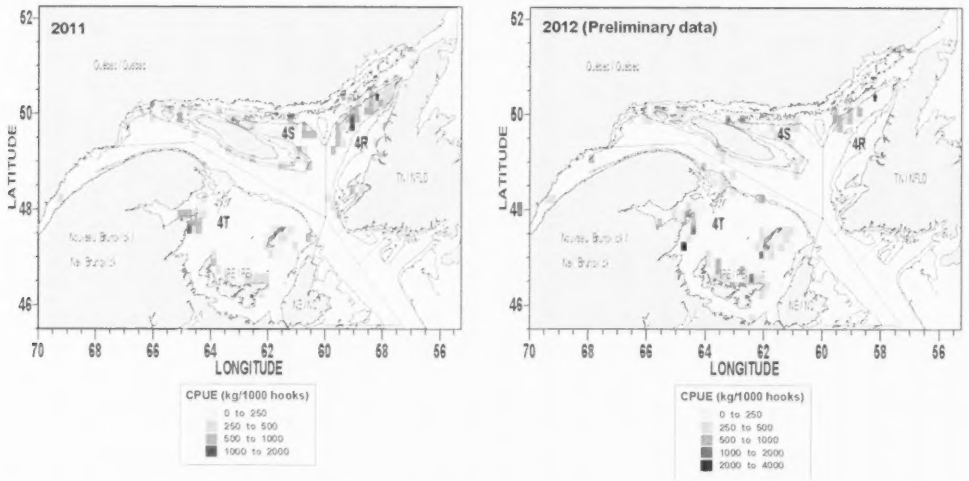


Figure 8. Catch rate spatial distribution for the Atlantic halibut directed longline commercial fishery in 2011 and 2012.

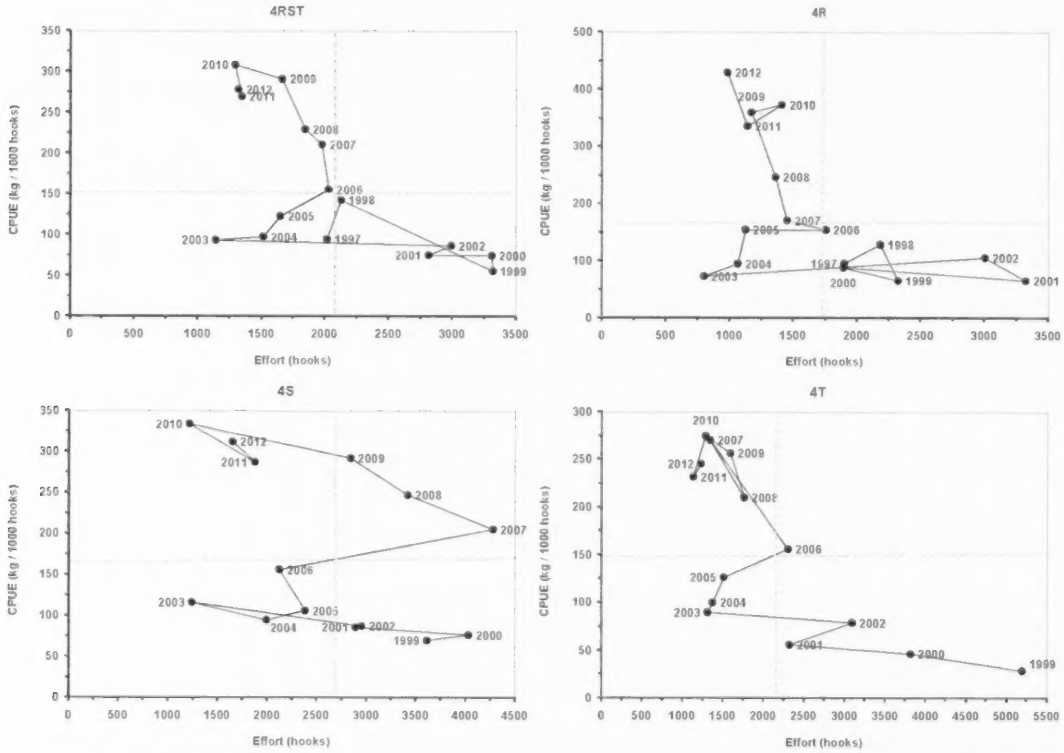


Figure 9. Mean annual values of Atlantic halibut directed longline commercial fishery indicators (CPUE and effort) per management unit and NAFO Division from 1997 to 2012. 2012 data are preliminary (for each indicator, the shaded dashed line represents the mean for all years except 2012).

Size and Recruitment

The size range of halibut measured during the scientific trawl surveys is mostly 20–150 cm (Figure 10). Catches are made up mainly of pre-recruits (halibut < minimum legal catch size). During the 2000s, the mean size in the Northern Gulf was generally above 60 cm, as opposed to the Southern Gulf where it rarely exceeded 50 cm except within the last three years (Figure 11). Analysis of median size reveals similar trends. Based on the surveys, the average median is mostly 55–90 cm in the Northern Gulf, whereas it only rarely exceeds 55 cm in the Southern Gulf. The weak representativeness of individuals measuring more than 120 cm stems in part from their reduced trawl catchability, on account of their ability to avoid the fishing gear.

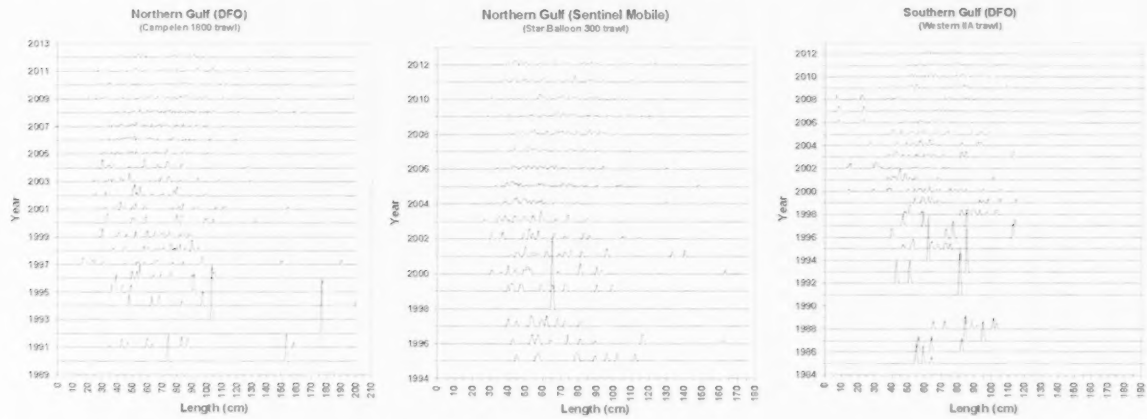


Figure 10. Size composition (%) of Atlantic halibut catches made during summer scientific trawl surveys between 1985 and 2012.

During the 2000s, the size of fish landed by the longline commercial fishery was mostly (80+% of landings) 81–120 cm, with an average median size of 94 cm for the 2000–2009 period. In 2010, with the minimum legal catch size increasing to 85 cm, the median size exceeded 100 cm (Figure 12). The modal size (representing the size of halibut most frequently landed) also increased to reach 90 cm, which suggests that the fishery targets the most represented mode in the size distribution. However, the median and modal sizes decreased between 2011 and 2012. Several hypotheses have been raised to explain this decline, including the presence of recruitment, fishery targeting of smaller sizes to protect reproductive potential and a more lucrative market. Meanwhile, the samples measured at sea by observers contained a significant proportion in numbers (20–40%) of fish below the minimum legal catch size (Table 4). The median size of pre-recruits was estimated at 67 cm for the 2000–2009 period and increased to 75+ cm starting in 2010.

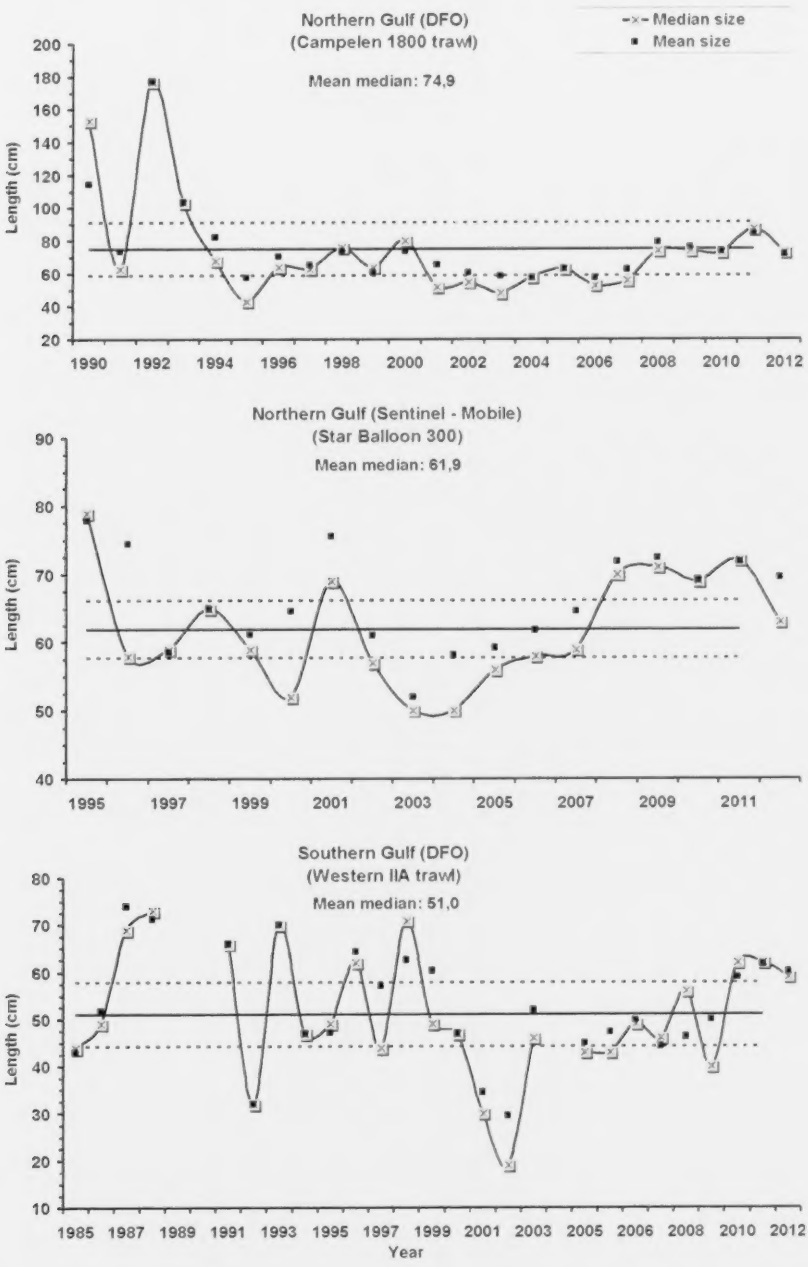


Figure 11. Median and mean sizes of Atlantic halibut captured in the summer scientific trawl surveys between 1985 and 2012 (the solid line represents the average median of the series for all years except 2012 and the dashed lines ± 0.5 standard deviation).

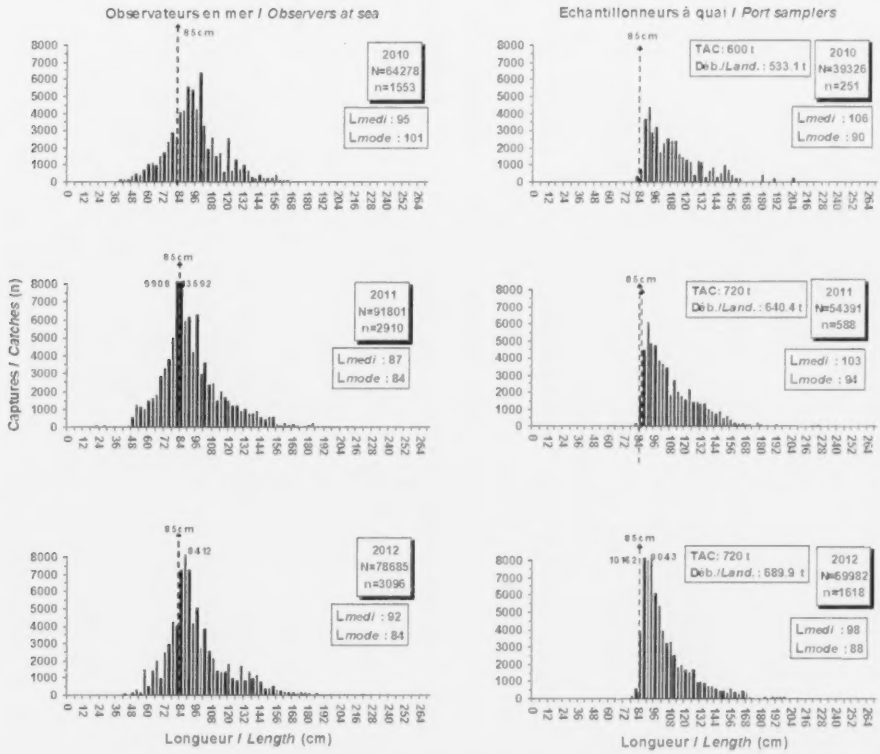


Figure 12. Size frequency distribution of Atlantic halibut measured at sea and dockside for the longline commercial fishery between 2010 and 2012 (N: estimated total number of Atlantic halibut found in catches; n: total number of Atlantic halibut measured in samples; L_{medi}: median length; L_{mode}: modal length; and the minimum legal catch size of 85 cm is indicated with an arrow).

Table 4. Proportions for different size categories of Atlantic halibut by gear type from catches at sea.

Gears (Year)	Proportion (%) of total catch at sea					
	Sublegal size		Commercial size		Large size (≥ 120 cm)	
	Weight	Number	Weight	Number	Weight	Number
Longline						
2007	11.6	34.1	88.4	65.9	33.5	13.1
2008	15.9	39.6	84.1	60.5	24.2	6.4
2009	7.2	18.4	92.8	81.6	17.6	4.7
2010	8.5	24.8	91.5	75.2	33.5	13.1
2011	13.9	34.6	86.1	65.4	35.1	11.2
2012	8.6	25.4	91.4	74.6	43.6	16.0
Gillnets						
2007	59.0	85.0	41.0	15.0	5.8	0.4
2008	44.7	86.8	55.3	13.2	14.5	1.4
2009	33.0	72.3	67.0	27.7	18.8	3.5
2010	44.4	78.7	55.6	21.3	1.1	0.1
2011	29.5	70.2	70.5	29.8	15.9	3.3
2012	28.2	59.6	71.8	40.4	9.9	2.2

Note: Between 2007 and 2009, the minimum legal catch size was 81 cm. In 2010, it was raised to 85 cm. The 2012 data are preliminary.

A more in-depth analysis of the halibut catches made with longlines and gillnets was conducted using at-sea observers' data from 2010–2012 (Table 4; Figure 13). During these years, the proportion of commercial-size halibut found in catches made by longliners was over 65% in numbers and 85% in weight. However, the proportion of sub-legal size halibut in gillnet catches was over 60% in numbers and 25–45% in weight. With the exception of 2012, the median size for all catches made using gillnets never exceeded 65 cm.

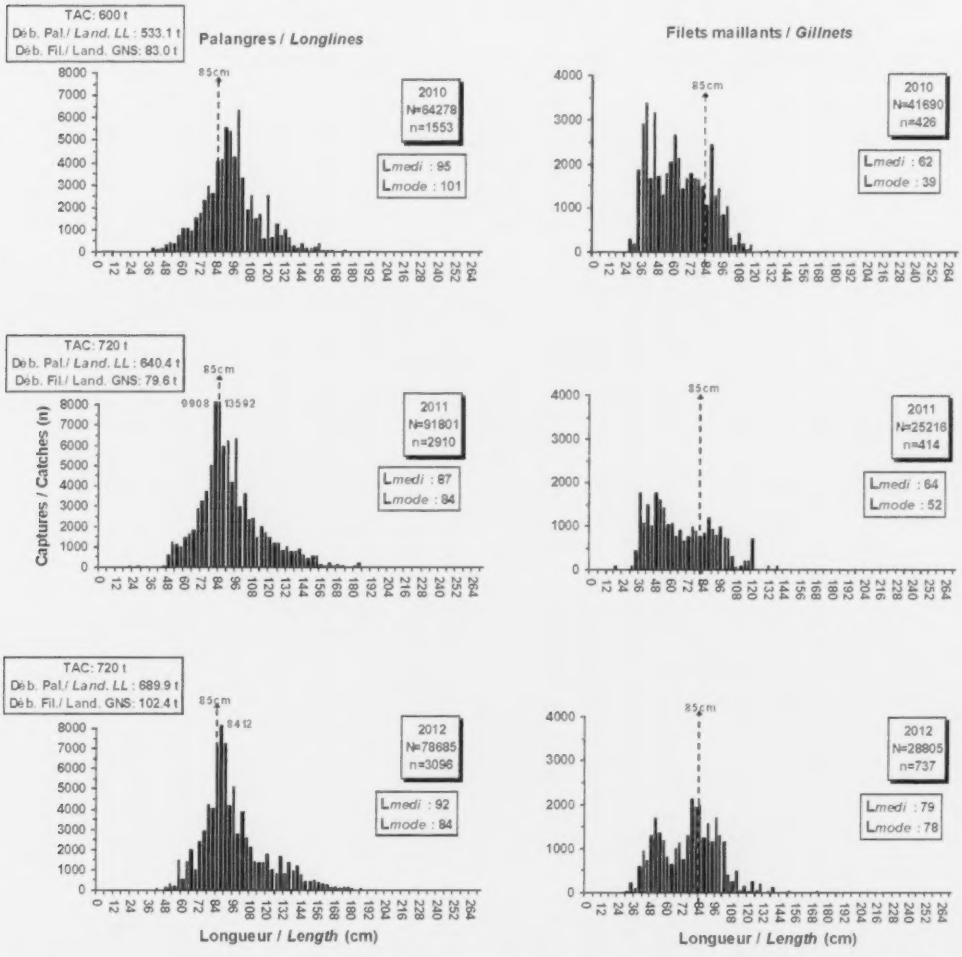


Figure 13. Size frequency distribution of Atlantic halibut measured at sea for the longline and gillnet commercial fishery [N: estimated total number of Atlantic halibut found in catches; n: total number of Atlantic halibut measured in samples; L_{medi}: median length; L_{mode}: modal length; and the minimum legal catch size is indicated with an arrow]. TAC and total annual landings for each gear type [LL: longline; GN: gillnet] are also indicated.

Sources of Uncertainty

Release of Atlantic Halibut

The release of Atlantic halibut caught using either longline or gillnet and its chances of survival remain topics of concern, particularly since neither releases nor the condition of released individuals (e.g., living, injured or moribund) are recorded. As indicated previously, fishing with gillnets, including the Greenland halibut directed fishery, still yields large quantities of Atlantic halibut of which a high proportion (60+%) must be released as these fish are of sub-legal size. Despite the implementation in recent years of management measures aiming to reduce the halibut by-catch (e.g., modifying the net mesh size and monitoring vessels more closely in problematic areas), volumes of released fish reportedly reached around 55 t in 2012 based on At-Sea Observer Program data. Yet the survival of Atlantic halibut caught by gillnet during the Greenland halibut fishery in the Gulf appears highly uncertain insofar as over a third of Atlantic halibut caught were already dead when nets were raised (Alain Fréchet, Maurice Lamontagne Institute, pers. comm.). Consequently, although not estimated, the actual fishing-related mortality rate is certainly higher than the rate associated with the landing statistics provided by the gillnet fleet.

For longline catches, it has been determined that the survival of smaller fish returned to the water could be good (97+%) in ideal handling conditions so as to minimize injuries. However, in a fishery where the discarding of Atlantic halibut by-catches of commercial size is mandatory (e.g., cod directed fishery), the survival rate may be greatly reduced for individuals near the legal size which, according to industry representatives, are frequently gaffed for measuring purposes before release. The survival rate for all other commercial-size halibut is reportedly high, such as among very large individuals that, according to the fishermen, are released easily without being gaffed, thereby minimizing the risk of injury.

Additional Sources of Uncertainty

There are no scientific longline surveys on the Gulf halibut that would make it possible to estimate its true abundance. As a result, it is impossible to calculate spawning biomass, fishing mortality or limit reference points to use in defining a strategic framework for the fishery and a TAC based on the precautionary approach guidelines.

Identification of the stock's breeding and rearing grounds as well as its genetic structure are additional aspects that require further study with a view to more accurately determining the stock status.

Industry Perspectives

As in the previous stock assessment in 2011, industry representatives have questioned the rather high estimates of the number of halibut caught in gillnets and released based on the At-Sea Observer Program data. They do not find these figures to be representative of this fleet overall insofar as a significant proportion of the observers allegedly focus on problematic cases, driving their estimates upward.

Moreover, the industry claims that the stock has reached an unparalleled abundance level and that the abundance indices (CPUE) calculated based on the commercial fishery have reached a ceiling because of fishing gear saturation. The industry considers that the assessment tools and

fishing techniques fail to accurately represent the strong growth of the stock which, according to them, has been ongoing since the mid-2000s. On these grounds, it finds that the TAC increase could be significantly higher than the increase proposed by Sciences.

CONCLUSIONS AND ADVICE

All indicators considered in assessing the status of the Gulf Atlantic halibut stock point toward the relative immunity of the stock to pressure from the commercial fishery during the 2000s. The values of demographic indicators (distribution, abundance and biomass) increased over this period to reach historical highs. CPUE values for the Atlantic halibut directed commercial fishery increased over the same time period and peaked within the last several years when fishing effort was decreasing.

Based on the size of halibut caught and measured at sea, pre-recruits remain abundant (25% in numbers) and halibut longer than 130 cm are still present (10% in numbers). However, according to the sizes measured among halibut landings, the commercial fishery continues to mainly harvest the immature component of the stock, i.e., halibut measuring 85–130 cm. In light of this fact, the species' long life cycle and late age of maturity, and the lack of information on the stock's productivity, caution should be exercised when deciding to increase catches.

Insofar as the great majority of stock status indicators in recent years have been positive and stable at levels exceeding series mean values, Sciences representatives find that the stock could tolerate a TAC increase by a maximum of 20% in total for the next two fishing seasons (2013 and 2014). However, industry stakeholders disagree with this recommendation. In their opinion, the stock is still growing and the TAC increase should consequently be greater.

SOURCES OF INFORMATION

This Science Advisory Report is from the February 27, 2013 Assessment of the Gulf of St. Lawrence (4RST) Atlantic halibut. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

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